PATENT ABSTRACTS OF JAPAN

(11)Publication number : 2002-264222
(43)Date of publication of application : 18.09.2002

(51)Int.Cl. B29C 67/00
G06F 17/50
// B29K103:08

(21)Application number : 2001-066488
(22)Date of filing : 09.03.2001

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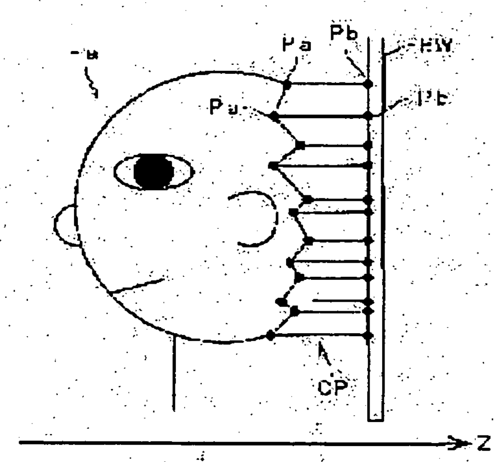
(54) DATA PROCESSING APPARATUS AND METHOD, RECORDING MATERIAL AND PROGRAM

(57)Abstract:
PROBLEM TO BE SOLVED: To provide a data processing technique capable of creating shaping data suitable for a shaping apparatus.
SOLUTION: In the data processing apparatus for transmitting shaping data to the shaping apparatus, the three-dimensional data of a surface shape Fa having an end part OP is processed as follows. That is, light is projected on the foundation BW of a relief having a main surface in the direction vertical to a Z-axis from the end points Pa of the end part OP forming openings in the surface shape Fa and these projection points Pb are added as new data points. By this constitution, the end part OP of the surface shape Fa is closed by the foundation BW of the relief to form a closed space therein. The three- dimensional data is formed on the basis of the closed space surrounded by the surface shape Fa and the surface shape constituted of the existing points Pa. As a result, the shaping data suitable for the shaping device can be formed.



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[Date of request for examination]
[Date of sending the examiner's decision of rejection]
[Kind of final disposal of application other than the examiner's decision of rejection or application converted registration]
[Date of final disposal for application]
[Patent number]
[Date of registration]
[Number of appeal against examiner's decision of rejection]
[Date of requesting appeal against examiner's decision of rejection]

* NOTICES *

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CLAIMS

[Claim(s)]
[Claim 1] The data processor characterized by to have an input means input the field configuration data which are the data processor which processes available molding data with three-dimensions molding equipment, and are applied to (a) side configuration, the means forming which perform predetermined data processing to the (b) aforementioned side configuration data, and form a closed space based on said field configuration, and a generation means generate molding data based on the (c) aforementioned closed space.
[Claim 2] It is the data processor characterized by having a means to perform processing to which said means forming closes the edge of said field configuration to said (b-1) field configuration data in a data processor according to claim 1, and to form said closed space.
[Claim 3] It is the data processor characterized by having a means to specify the space inserted into a means to perform processing which said means forming makes move [specified quantity] said (b-2) field configuration in a data processor according to claim 1 or 2, and generates a new field configuration, and said (b-3) field configuration and said new field configuration as said closed space.
[Claim 4] In an input means to input the field configuration data which are the data processor which processes available molding data with three-dimensions molding equipment, and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration When an extract means to extract the border line concerning said field configuration, and the (c) aforementioned border line are not closed curves The data processor characterized by having the means forming which performs interpolation processing to said border line, and forms a closed curve, and a generation means to generate molding data based on the (d) aforementioned closed curve.
[Claim 5] In an input means to input the field configuration data which are the data processor which processes available molding data with three-dimensions molding equipment, and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration The data processor characterized by having an extract means to extract the border line concerning said field configuration, a processing means to perform data processing which extends the line breadth of the (c) aforementioned border line, and a generation means to generate molding data based on the border line with which line breadth was extended with the (d) aforementioned processing means.
[Claim 6] The data-processing approach characterized by to have the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and apply to (a) side configuration, the formation process which perform predetermined data processing to the (b) aforementioned side configuration data, and form a closed space based on said field configuration, and the generation process which generate molding data based on the (c) aforementioned closed space.
[Claim 7] It is the data-processing approach characterized by having the process which performs processing to which said formation process closes the edge of said field configuration to said (b-1) field configuration data in the data-processing approach according to claim 6, and forms said closed space.
[Claim 8] It is the data-processing approach characterized by having the process which specifies the space inserted into the process which performs processing which said formation process makes move [specified quantity] said (b-2) field configuration in the data-processing approach according to claim 6 or 7, and generates a new field configuration, and said (b-3) field configuration and said new field configuration

as said closed space.
[Claim 9] In the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration The extract process which extracts the border line concerning said field configuration, and when the (c) aforementioned border line is not a closed curve The data-processing approach characterized by having the formation process which performs interpolation processing to said border line, and forms a closed curve, and the generation process which generates molding data based on the (d) aforementioned closed curve.
[Claim 10] In the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration The data-processing approach characterized by having the extract process which extracts the border line concerning said field configuration, down stream processing which performs data processing which extends the line breadth of the (c) aforementioned border line, and the generation process which generates molding data based on the border line with which line breadth was extended with the (d) aforementioned processing means.
[Claim 11] The record medium which is characterized by recording the program for operating the data processor concerned as a data processor of either claim 1 thru/or claim 5 by being installed in the computer built in the data processor and in which computer read is possible.
[Claim 12] The program characterized by operating the data processor concerned as a data processor of either claim 1 thru/or claim 5 by being installed in the computer built in the data processor.

[Translation done.]

DETAILED DESCRIPTION

[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the data-processing technique of processing available molding data with three-dimensions molding equipment.
[0002]
[Description of the Prior Art] In molding equipments, such as rapid prototyping using a powder laminated layers method, a solid object is molded based on the molding field specified by the inputted molding data. In this molding field, since it is the space of combining an ingredient, it is necessary to be the closed solid configuration which has the fixed volume.
[0003]
[Problem(s) to be Solved by the Invention] However, in above molding equipment, since it is not data showing the closed solid configuration when the surface type-like data showing a part of body front face acquired by the three-dimensions metering device etc. are inputted as molding data, a molding field cannot be specified and molding processing cannot be performed appropriately.
[0004] This invention is made in view of the above-mentioned technical problem, and aims at offering the data-processing technique which can generate the molding data suitable for molding equipment.
[0005]
[Means for Solving the Problem] In order to solve the above-mentioned technical problem, invention of claim 1 is the data processor which processes available molding data with three-dimensions molding equipment, and is equipped with an input means input the field configuration data concerning (a) side configuration, the means forming which perform predetermined data processing to the (b) aforementioned side configuration data, and form a closed space based on said field configuration, and a generation means generate molding data based on the (c) aforementioned closed space.
[0006] Moreover, in the data processor which invention of claim 2 requires for invention of claim 1, said means forming performs processing which closes the edge of said field configuration to said (b-1) field configuration data, and has a means to form said closed space.
[0007] Moreover, in the data processor which invention of claim 3 requires for invention of claim 1 or claim 2, said means forming has a means to specify the space inserted into a means to perform processing which only the specified quantity makes move said (b-2) field configuration, and generates a new field configuration, and said (b-3) field configuration and said new field configuration as said closed space.
[0008] Moreover, invention of claim 4 is a data processor which processes available molding data with three-dimensions molding equipment, and is set to an input means to input the field configuration data concerning (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration. It has an extract means to extract the border line concerning said field configuration, the means forming which performs interpolation processing to said border line, and forms a closed curve when the (c) aforementioned border line is not a closed curve, and a generation means to generate molding data based on the (d) aforementioned closed curve.
[0009] Moreover, invention of claim 5 is a data processor which processes available molding data with three-dimensions molding equipment, and is set to an input means to input the field configuration data concerning (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration. It has an extract means to extract the border line concerning said field configuration, a processing means

to perform data processing which extends the line breadth of the (c) aforementioned border line, and a generation means to generate molding data based on the border line with which line breadth was extended with the (d) aforementioned processing means.
[0010] Moreover, invention of claim 6 is equipped with the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and are applied to (a) side configuration, the formation process which performs predetermined data processing to the (b) aforementioned side configuration data, and form a closed space based on said field configuration, and the generation process which generate molding data based on the (c) aforementioned closed space.
[0011] Moreover, in the data-processing approach which invention of claim 7 requires for invention of claim 6, said formation process performs processing which closes the edge of said field configuration to said (b-1) field configuration data, and has the process which forms said closed space.
[0012] Moreover, in the data-processing approach which invention of claim 8 requires for invention of claim 6 or claim 7, said formation process has the process which specifies the space inserted into the process which performs processing which only the specified quantity makes move said (b-2) field configuration, and generates a new field configuration, and said (b-3) field configuration and said new field configuration as said closed space.
[0013] Moreover, invention of claim 9 is set to the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration. It has the extract process which extracts the border line concerning said field configuration, the formation process which performs interpolation processing to said border line, and forms a closed curve when the (c) aforementioned border line is not a closed curve, and the generation process which generates molding data based on the (d) aforementioned closed curve.
[0014] Moreover, invention of claim 10 is set to the input process which inputs the field configuration data which process available molding data with three-dimensions molding equipment, and which are the data-processing approach and are applied to (a) side configuration, and the slice cut surface about the (b) aforementioned side configuration. It has the extract process which extracts the border line concerning said field configuration, down stream processing which performs data processing which extends the line breadth of the (c) aforementioned border line, and the generation process which generates molding data based on the border line with which line breadth was extended with the (d) aforementioned processing means.
[0015] Moreover, invention of claim 11 is recording the program for operating the data processor concerned as a data processor of either claim 1 thru/or claim 5 by being installed in the computer built in the data processor.
[0016] Moreover, invention of claim 12 operates the data processor concerned as a data processor of either claim 1 thru/or claim 5 by being installed in the computer built in the data processor.
[0017]
[Embodiment of the Invention] <1st operation gestalt <important section configuration of molding system>> drawing 1 is the schematic diagram showing the important section configuration of molding system 1A concerning the 1st operation gestalt of this invention.
[0018] Molding system 1A is equipped with the molding equipment 3 connected with data-processor 2A and data-processor 2A possible [transmission] through a cable 11.
[0019] It is constituted as a personal computer or a workstation and data-processor 2A has the processing section 20 which has a box-like configuration, the control unit 21, and the display 22.
[0020] The processing section 20 is a part which processes three-dimensions data etc., and has the drive 201 which inserts the record media 9, such as an optical disk, in the front face.
[0021] The control unit 21 has the mouse 211 and the keyboard 212, and receives the alter operation to data-processor 2A from an operator.
[0022] The display 22 consists of CRT and a display is performed based on the directions from the processing section 20.
[0023] Drawing 2 is drawing showing functional block of data-processor 2A.
[0024] The processing section 20 of data-processor 2A is equipped with I/O I/F23 linked to an above-mentioned control unit 21 and an above-mentioned display 22, and control-section 24A electrically

connected to I/O I/F23. Moreover, the processing section 20 is equipped with the storage section 25 electrically connected to control-section 24A, I/O I/F26, and communication link I/F27.
[0025] I/O I/F23 is an interface for controlling transmission and reception of data between a control unit 21 and a display 22, and control-section 24A.
[0026] The storage section 25 is constituted as a hard disk, and stores three-dimensions data etc.
[0027] I/O I/F26 is an interface for outputting and inputting the data to a record medium 9 through drive 201.
[0028] Communication link I/F27 is an interface for performing data transmission with molding equipment 3 through a cable 11. the slice data mentioned later are transmitted through this communication link I/F27 -- things -- **
[0029] Control-section 24A is a part which has CPU241 and memory 242, controls above-mentioned each part organically, and carries out generalization control of the actuation of data-processor 2A. Moreover, in control-section 24A, processing which generates slice data based on field configuration data so that it may mention later is also performed.
[0030] The program data currently recorded on the record medium 9 are storable in the memory 242 of this control-section 24A through I/O I/F26. Thereby, this stored program can be reflected in actuation of data-processor 2A.
[0031] Return and explanation are continued to drawing 1 .
[0032] Molding equipment 3 molds a three-dimensions molding object by repeating the actuation in which the combination of a powder ingredient is made to form with a binder (binder), carrying out the laminating of the powder ingredient.
[0033] With this molding equipment 3, based on the slice data inputted into the control section 30 through the cable 11 from data-processor 2A, each part is controlled and a solid object is generated. Below, actuation of molding equipment 3 is explained briefly.
[0034] First, the powder ingredient supplied from the tank 31 which holds powder ingredients, such as gypsum fibrosum and starch, is opened to homogeneity on the molding stage 33 with a blade 32 at a thin layer 91. Next, in the thin layer 91 of this powder ingredient, the head 34 of an ink jet is scanned based on the inputted slice data, and a binder is applied to a molding field. The powder ingredient of the field where this binder was applied is combined with a lower layer or an adjoining hardening field. The molding stage 33 is gradually dropped in the shape of a step, the thin layer of a powder ingredient is formed one by one, and the actuation which applies a binder from the head of an ink jet is repeated until molding is completed. And if molding is completed, in order that the powder ingredient of the field where a binder is not applied may maintain the condition (uncombined condition) of having become independent separately, the solid object 92 combined with the binder can be taken out, and the solid object 92 will be obtained.
[0035] With this molding equipment 3, it becomes the field where the space Vo of the shape of a cube surrounded by the concave molding tub 35 which touches field 33 in which laminating is possible, i.e., rectangle-like molding stage, and molding stage 33 side face can mold a powder ingredient. That is, it is necessary to generate molding data by data-processor 2A so that it may fit in the work-piece field corresponding to this field that can be molded.
[0036] <Actuation of three-dimensions molding system 1A> drawing 3 is a flow chart which shows fundamental actuation of data-processor 2A among molding system 1A.
[0037] Below, the front face of a person's face SJ is measured, for example with the three-dimensions metering devices 4 (refer to drawing 4), such as VIVID700, this measured shape of surface type Fa (refer to drawing 5) is mentioned as an example, and actuation of data-processor 2A is explained.
[0038] As shown in drawing 5 , the shape of surface type Fa about the surface type-like data DS acquired with the three-dimensions metering device 4 is not what data like a solid configuration closed completely, and has the edge OP which forms opening. Although this can measure the data of a front face part in the three-dimensions metering device 4, the data of the regio occipitalis capitis are because it cannot measure at once. Moreover, the surface type-like data DS which are data of this face part are constituted in the standard coordinates specified with a three-dimensions metering device as point group data of the shape of a grid on the front face of a face.
[0039] About the above-mentioned surface type-like data DS, since it has Edge OP and does not have the substantial volume even if inputted into molding equipment 3, a molding object is ungenerable. Then, this technical problem is solved by performing data processing explained below.

[0040] At step S1, the three-dimensions data which an operator specifies a data file, for example, express an object from a record medium 9 are read. The surface type-like data DS acquired with the three-dimensions metering device 4 will specifically be specified, and it will be inputted into data-processor 2A.
[0041] In addition, as three-dimensions data read into data-processor 2A, the point group data expressing three-dimensions data formats, such as DXF, IGES, and VRML, STL, or an objective three-dimensions coordinate point are mentioned.
[0042] The surface type-like data DS are changed into the workpiece coordinate system of molding equipment 3 at step S2. Since the surface type-like data DS are described by the system of coordinates specified with the three-dimensions metering device 4, this is because it is necessary to change into the workpiece coordinate system which serves as criteria of molding in molding equipment 3.
[0043] In this conversion, when the surface type-like data DS overflow a work-piece field, that is displayed on a display 22, it warns an operator, and zooming of the surface type-like data DS is urged. In addition, it is desirable that scale conversion to which the surface type-like data DS are settled in a work-piece field with the maximum size by the default is performed here.
[0044] At step S3, a solidification parameter for an operator to edit the shape of surface type Fa into a solid configuration is inputted interactively. Here, while performing various kinds of setup, such as a location in the slice pitch and the number of laminatings at the time of molding a solid object with molding equipment 3, and a work-piece field, a solidification parameter is inputted so that a closed space may be formed from the shape of surface type Fa with opening. About the input of this solidification parameter, it mentions later.
[0045] In step S4, based on the solidification parameter inputted at step S3, data are added to the surface type-like data DS and a closed space on the basis of the shape of surface type Fa is formed. Also about this detailed actuation, it mentions later.
[0046] At step S5, the surface type-like data DS with which a closed space was formed by step S4 are changed into polygon data. In this conversion, it is carried out using the algorithm shown, for example in the following reference.
At Hugues Hoppe, Tonny DeRose, Tom Dochamp, John Mcdonald, and 71 to and Werner Stuetzle.Surface reconstruction from unorganized points.In Proc.of ACM SIGGRAF1992 pp78 step S6, the slice image which sliced the polygon data changed at step S5 in many parallel cross sections is generated, and sequential transmission is carried out through a cable 11 at molding equipment 3. The slice data which are molding data specifically obtained by cutting a polygon into round slices in the slice pitch inputted at step S3 will be sent to molding equipment 3. Here, since polygon data are expressing the solid configuration closed by processing by step S4, it is data which can be used for molding with molding equipment 3.
[0047] And based on this slice data, the binder spreading field in a powder layer is determined, and a solid object is molded in molding equipment 3.
[0048] It is the flow chart which shows actuation of an input of the solidification parameter corresponding to [input / of < solidification parameter] the above-mentioned step S3 in > drawing 6 .
[0049] At step S11, it judges whether there is any demand which adds thickness in the shape of [which starts the surface type-like data DS by the operator / Fa] surface type. That is, the surface type-like data DS do not have thickness, but it is data of the configuration which does not have the volume substantially, and the existence of the demand from the operator who gives this thickness is judged. Here, when there is a demand which adds thickness, it progresses to step S12, and in not adding thickness, it progresses to step S13.
[0050] At step S12, the thickness t for giving thickness in the shape of [Fa] surface type is inputted by actuation to an operator's control unit 21.
[0051] It judges whether there is any demand which fills up with step S13 the contents of the shape of surface type Fa specified by the operator by the surface type-like data DS. Here, when there is a demand filled up with contents, it progresses to step S14, and when not filled up with contents, it progresses to step S15.
[0052] Offset is inputted at step S14. this offset points out the distance of the foundation of relief and configuration data which are newly defined -- it is. As shown in drawing 7 , when the foundation BW of relief is specifically located in Zo, a difference with Z value of the data which serve as max at a Z direction serves as Offset GP among the shape of surface type Fa with this Zo.
[0053] At step S15, since it is not the solid configuration which the shape of surface type Fa closed, the

purport treated as an error with molding equipment 3 is displayed on a display 22, and an operator's attention is called.
[0054] Although the thickness t which is a solidification parameter, or Offset GP is inputted by the above actuation, based on this parameter, the following data processing is performed by the above-mentioned step S4.
[0055] When thickness t is inputted, as shown in drawing 8 , the new point Pt to which only distance u moved the point Ps which constitutes the shape of surface type Fa is added toward the center of gravity Og in the shape of surface type Fa. This distance u corresponds to the inputted thickness t. The three-dimensions data which the space across which it faces by this between the existing shape of surface type Fa and the new field configuration which consists of new points Pt turns into a closed space, and have the closed solid configuration are generable.
[0056] On the other hand, when Offset GP is inputted, as shown in drawing 9 , each endpoint Pa of the shape of surface type Fa is projected on a Z direction to the foundation BW of relief, and this projecting point Pb is added as a new data point. Thereby, it is covered by the foundation BW of relief to the edge OP of the shape of surface type Fa, and a closed space is formed in the interior. That is, based on the closed space surrounded between the shape of surface type Fa, and the field configuration which consists of added each point Pb, the three-dimensions data of the closed solid configuration which can be filled up with contents are generable.
[0057] In addition, when molding equipment 3 receives the input of color data, the color information on an object is transmitted at the time of slice data transmission at the above-mentioned step S6. In this case, also as for the color information on the foundation BW of the relief specified by an operator, it is desirable to transmit with the color information on the above-mentioned object.
[0058] Since the data of the solid configuration closed by actuation of the above molding system 1A based on the surface type-like data acquired with the three-dimensions metering device etc. are generable, it can mold appropriately with molding equipment.
[0059] Although three-dimensions molding system 1B concerning the 2nd operation gestalt of <2nd operation gestalt> this invention is similar with three-dimensions molding system 1A of the 1st operation gestalt, control-section 24B of data-processor 2B differs.
[0060] That is, the point of storing the program for control-section 24B of data-processor 2B performing actuation explained below is different from control-section 24A of the 1st operation gestalt.
[0061] <Actuation of molding system 1B> drawing 10 is a flow chart which shows fundamental actuation of data-processor 2B among molding system 1B.
[0062] Below, the three-dimensions data of the shape of surface type Fa (drawing 5) which measured and acquired a person's face SJ with the three-dimensions metering device 4 shown in drawing 4 are mentioned as an example, and actuation of data-processor 2B is explained.
[0063] At step S21 and step S22, the same actuation as step S1 and step S2 which are shown in the flow chart of drawing 3 is performed.
[0064] At step S23, the solidification parameter for editing the shape of surface type Fa into a solid configuration is inputted by the operator. Here, while performing various kinds of setup, such as a location in the slice pitch and the number of laminatings at the time of molding a solid object with molding equipment 3, and a work-piece field, the thickness t for giving the volume fixed in the shape of [Fa] surface type is inputted.
[0065] At step S24, the two-dimensional profile line drawing image data which extracted the border line of the shape of surface type Fa are generated as slice data sliced in many parallel cross sections to the shape of surface type Fa.
[0066] At step S25, based on the above-mentioned profile line drawing image data, the spreading field which applies a binder with molding equipment 3 is determined so that a solid object can be molded in molding equipment 3. About the decision approach of this binder spreading field, it mentions later.
[0067] At step S26, slice data are transmitted to molding equipment 3 one by one. By this, based on this slice data, the binder spreading field in a powder layer will be determined, and a solid object will be molded with molding equipment 3.
[0068] <Decision approach of binder spreading field> drawing 11 is drawing showing the example of the slice data mentioned above. Drawing 11 (a) - drawing 11 (c) show each border lines K1, K2, and K3 used as the intersection of this cross section and the shape of surface type Fa, when the surface type-like data

DS shown in drawing 5 are sliced in each cross section parallel to XY flat surface. Here, in drawing 11 (c), the border line has broken off because [of the cross-section data in near edge OP shown in drawing 5].
[0069] In the above-mentioned profile line drawing image data, as shown in drawing 11 (a) and (b), when the border line forms the closed curve, as shown in drawing 12 (a) and (b), the interior (parallel slash section) is specified as a binder spreading field. On the other hand, since the binder spreading field which has a fixed area like drawing 12 (c) cannot be specified when a border line is not a closed curve like drawing 11 (c), edit processing of the border line is carried out as follows.
[0070] That is, about the approach of determining a binder spreading field in case a border line is not a closed curve, it is roughly classified into two, the approach of making line breadth of (1) border line thick, and making this part a binder spreading field, and the approach of connecting the border line which (2) broke off, considering as a closed curve, and making this interior a binder spreading field.
[0071] (1) Although approach drawing 13 (a) which makes a border line thick is drawing which expanded a part of border line K3 Kp (drawing 11 (c)), below, it mentions a part of this border line Kp as an example, and explains this approach.
[0072] drawing 13 (a) -- ** -- like, a part of border line Kp is the set of the straight-line-like segments Q1-Q4, and these segments Q1-Q4 have normal vectors V1-V4 towards the outside of a field, as shown in drawing 13 (b). Then, Field Ep (parallel slash section of drawing 13 (b)) is formed by extending line breadth to the opposite sense to normal V1 - V4 direction, and let this field Ep be a binder spreading field in molding equipment 3. About the line breadth of this field Ep, it will correspond to the thickness t inputted at the above-mentioned step S23.
[0073] Thus, the field which has a fixed area can be secured by adding thickness to curves which do not have line breadth substantially, such as a surface border line, and molding with molding equipment 3 is attained by applying a binder to this field.
[0074] In addition, when the surface type-like data DS are color data, line breadth makes it thick in the color and the same color in which it is painted.
[0075] (2) When having broken off like the border line K3 shown in approach drawing 11 (c) which connects a line, as shown in drawing 14 , perform interpolation processing which connects the endpoints where distance is the nearest, form a closed curve, and make the contrant region (parallel slash section) into a binder field. It is adding the straight line which connects an endpoint and an endpoint as connecting this endpoint, or a curve.
[0076] In addition, about the border line which is disconnected and does not form the closed curve, the endpoints presumed to be the optimal as follows besides connecting the endpoints where distance is above the nearest may be connected.
[0077] ** Set it as a parameter which endpoints to be made to connect, and connect an endpoint so that a correlation Seki multiplier with the shape of profile linearity of the slice data of just before or an immediately after may serve as max.
[0078] ** Set it as a parameter which endpoints to be made to connect, and connect an endpoint so that difference with the shape of profile linearity of the slice data of just before or an immediately after may serve as min.
[0079] About above ** and **, when the slice data in front of the slice data shown in drawing 11 (c) are drawing 11 (b), correlation with the elliptical border line K2 shown in drawing 11 (b) serves as max, or a border line K3 will be connected in the shape of an ellipse, for example so that difference may serve as min (drawing 14).
[0080] About <modification> O this invention, you may apply to the field configuration data DT expressing the configuration Fb of the surface of the earth shown not only in the surface type-like data of a person like each above-mentioned operation gestalt but in drawing 15 .
[0081] When performing panorama solid molding based on altitude data, such as a topographical map, it can consider that the field configuration data DT with which the altitude data of an every place point are described are point group data, and they can be treated. As shown in drawing 9 , the molding data of three dimensions can be generated as space which the shape of relief closed by newly defining the foundation BS of relief and adding a new point on the foundation BS.
[0082] Here, about this foundation BS, if Foundation BS is set, for example as the level surfaces, such as a sea surface, since [used as the criteria of altitude data] an altitude value can use as offset, relief-like molding data can generate automatically. And based on the molding data expressing this closed solid

configuration, molding equipment 3 can perform panorama solid molding of geographical feature.
[0083] O It could be made to unite with the molding equipment in the above-mentioned operation gestalt about a data processor.
[0084] O About the molding equipment of each above-mentioned operation gestalt, not only powder laminating type molding equipment but molding equipments, such as the Mitsuzo form type, may be used.
[0085] O It is not indispensable to input into molding equipment through a communication wire about three-dimensions data from a data processor, and it may be inputted into molding equipment through a record medium etc.
[0086] O In this invention, the closed curve of all consisting of curves shall not be indispensable, and what contains a straight line in a part, a polygon, etc. shall correspond.
[0087]
[Effect of the Invention] As explained above, according to invention of claim 1 thru/or claim 12, predetermined data processing is performed to the field configuration data concerning a field configuration, a closed space based on a field configuration is formed, and molding data are generated based on a closed space. Consequently, the molding data suitable for molding equipment are generable.
[0088] Since processing which closes the edge of a field configuration to field configuration data is performed and a closed space is especially formed in invention of claim 2 and claim 7, molding data are easily generable.
[0089] Moreover, in invention of claim 3 and claim 8, since the space inserted into a field configuration and the new field configuration to which only the specified quantity moved the field configuration is specified as a closed space, molding data are easily generable.
[0090] Moreover, in invention of claim 4 and claim 9, when the border line extracted in the slice cut surface about a field configuration is not a closed curve, interpolation processing is performed to a border line, a closed curve is formed, and molding data are generated based on a closed curve. Consequently, the molding data suitable for molding equipment are generable.
[0091] Moreover, in invention of claim 5 and claim 10, the line breadth of the border line extracted in the slice cut surface about a field configuration is extended, and molding data are generated based on the extended border line. Consequently, the molding data suitable for molding equipment are generable.

[Translation done.]

DESCRIPTION OF DRAWINGS

[Brief Description of the Drawings]
[Drawing 1] It is the schematic diagram showing the important section configuration of molding system 1A concerning the 1st operation gestalt of this invention.
[Drawing 2] It is drawing showing functional block of data-processor 2A.
[Drawing 3] It is the flow chart which shows fundamental actuation of data-processor 2A among molding system 1A.
[Drawing 4] It is drawing showing signs that a person's face SJ is measured with the three-dimensions metering device 4.
[Drawing 5] It is drawing showing the shape of surface type Fa measured with the three-dimensions metering device 4.
[Drawing 6] It is the flow chart which shows actuation of an input of a solidification parameter.
[Drawing 7] It is drawing for explaining Offset GP.
[Drawing 8] It is drawing for explaining the example of the processing which forms a closed space based on the shape of surface type Fa.
[Drawing 9] It is drawing for explaining the example of the processing which forms a closed space based on the shape of surface type Fa.
[Drawing 10] It is the flow chart which shows fundamental actuation of data-processor 2B among molding system 1B concerning the 2nd operation gestalt of this invention.
[Drawing 11] It is drawing showing the example of slice data.
[Drawing 12] It is drawing for explaining the binder spreading field in slice data.
[Drawing 13] It is drawing for explaining the example of the processing which determines a binder spreading field.
[Drawing 14] It is drawing for explaining the example of the processing which determines a binder spreading field.
[Drawing 15] It is drawing showing the configuration Fb of the surface of the earth concerning the modification of this invention.
[Description of Notations]
1A, 1B Molding system
2A, 2B Data processor
3 Molding Equipment
21 Control Unit
22 Display
24 Control Section
25 Storage Section
DS, DT Surface type-like data
Fa, Fb The shape of surface type
OP Edge

[Translation done.]

* NOTICES *

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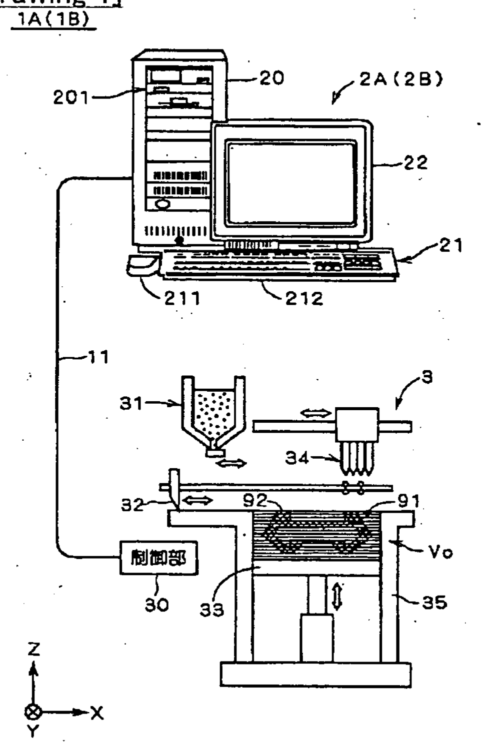
1.This document has been translated by computer. So the translation may not reflect the original precisely.

2.**** shows the word which can not be translated.
3.In the drawings, any words are not translated.

DRAWINGS

[Drawing 1]



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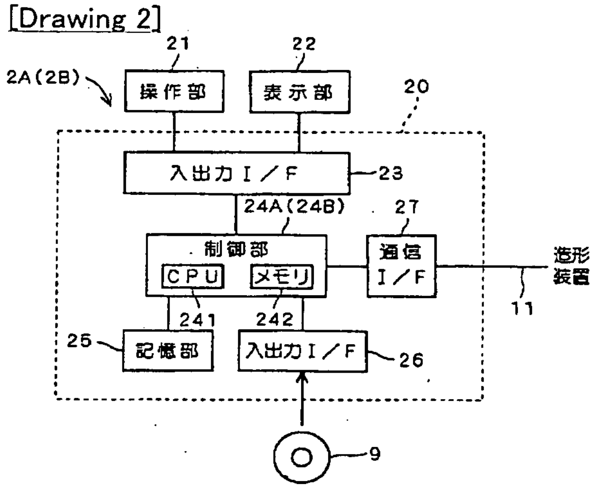

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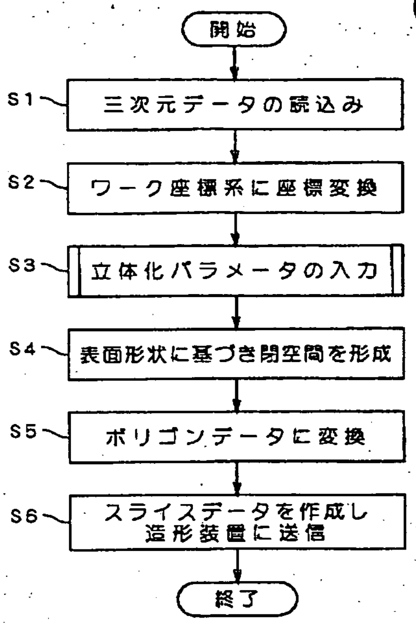

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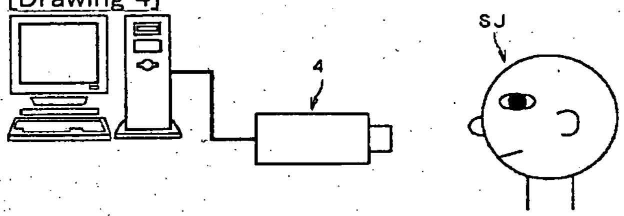

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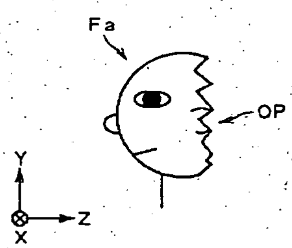

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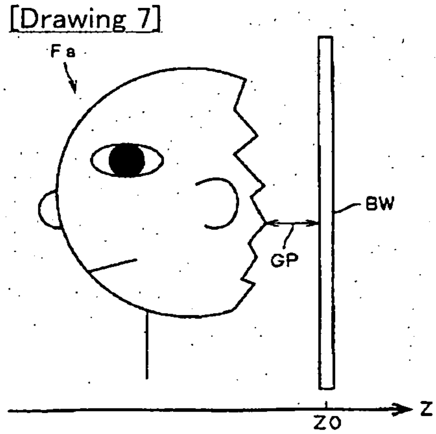

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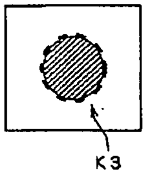

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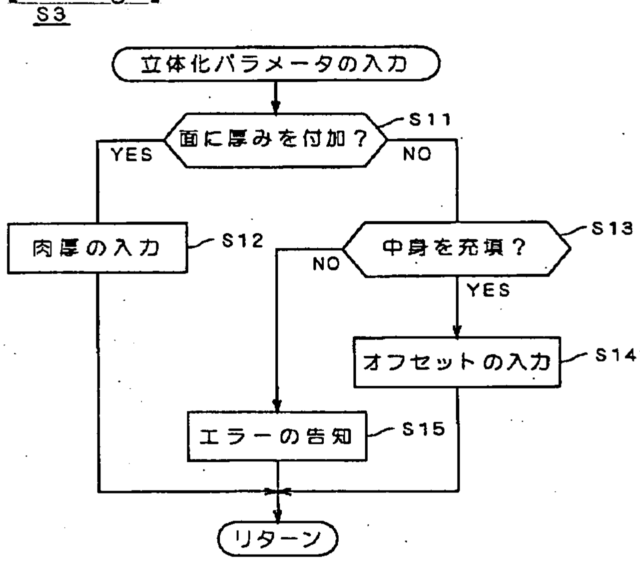
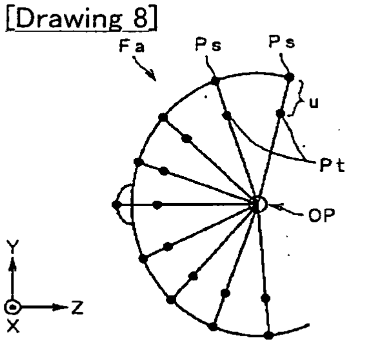


[Drawing 8]



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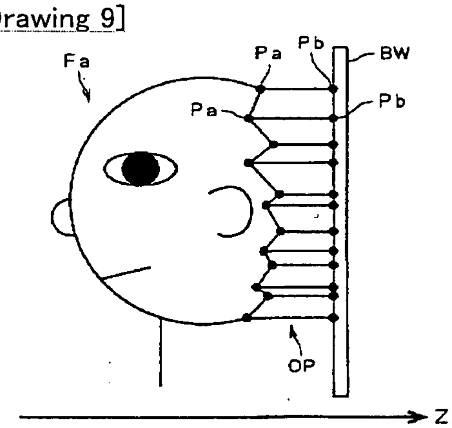
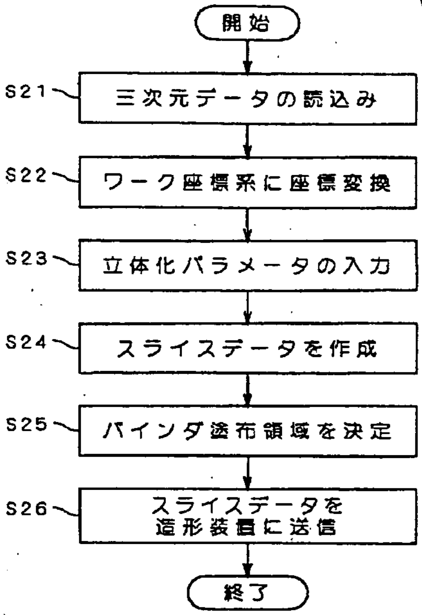


[Drawing 10]



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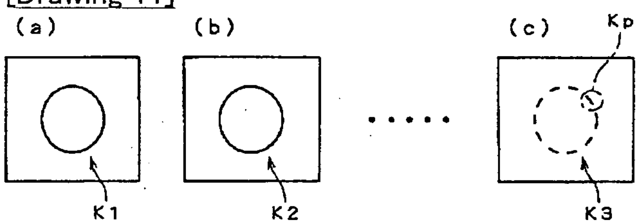

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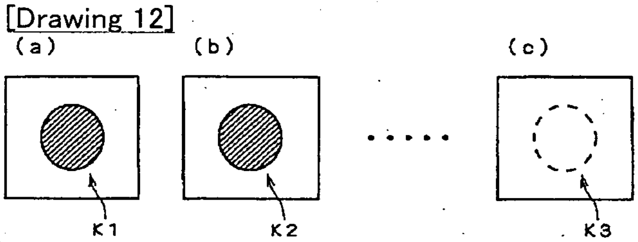
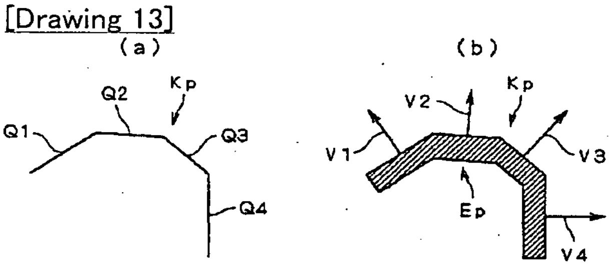
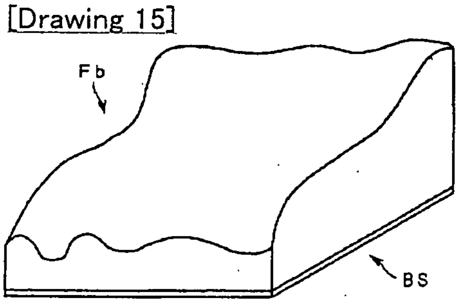


[Drawing 13]



[Drawing 15]



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